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Evaluation and Management of Chronic Wasting Disease Transmission

Kurt C. VerCauteren

USDA-APHIS-Wildlife Services, kurt.c.vercauteren@usda.gov

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Evaluation and Management of Chronic Wasting Disease Transmission

Contact Information:

Dr. Kurt C. VerCauteren, Wildlife Services Research Wildlife Biologist

NWRC Headquarters

4101 LaPorte Ave.

Fort Collins, CO 80521

Phone: (970) 266-6093 FAX: (970) 266-6089

Email: kurt.c.vercauteren@aphis.usda.gov

Web site: <http://www.aphis.usda.gov/ws/nwrc/>

National Wildlife Research Center Scientists Assess the Potential for Chronic Wasting Disease (CWD) Transmission Between Wild and Domestic Cervids and Develop Methods to Reduce/Manage the Disease

Wildlife Services' (WS) National Wildlife Research Center (NWRC) is the only Federal research organization devoted exclusively to resolving conflicts between people and wildlife through the development of effective, selective, and acceptable methods, tools, and techniques.

As increased urbanization leads to a loss of traditional wildlife habitat, the potential for conflicts between people and wildlife increases. Such conflicts can take many forms, but recently the potential for the transmission of diseases among wildlife, livestock, and humans has received greater attention.

Chronic wasting disease (CWD) is a fatal neurological disease that infects captive and wild cervids, including deer and elk. CWD is arguably the most important management issue for wild cervids because it has the potential to reduce populations long-term and have major socio-economic impacts. North American cervids susceptible to CWD include white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), and elk (*Cervus elaphus*).

CWD is caused by abnormal proteins that lack nucleic acids called prions. Prions change normal proteins in the host animal's cells

Major Research Accomplishments:

- WS studied interactions between farmed and wild cervids at fencelines to assess the potential for CWD transmission.
- WS developed new censusing methods for cervids, as well as new methods for locating and eradicating disease-infected animals.
- WS made progress toward the development of a CWD vaccine.
- WS evaluated white-tailed deer and mule deer ecology along riparian areas relative to the transmission and spread of CWD.
- WS developed new methods to test for the presence of CWD in live and dead animals.
- WS is aiding in the development of products to disinfect surfaces and areas contaminated with CWD.
- WS is helping to determine the origin and transmission routes of CWD.



resulting in concentrations of abnormal proteins. Over time these abnormal proteins accumulate in the central nervous and lymphatic systems causing a degenerative lack of control and a "wasting-away" death.

There is no known cure or vaccine for CWD. The origin of CWD is unknown. The disease may have existed in the wild or began in captivity under abnormally high deer densities. CWD was first observed in 1967 at the Colorado Division of Wildlife's Research Facility in Fort Collins, CO, where it was initially believed to be malnutrition. In 1977 CWD was determined to be a transmissible spongiform encephalopathy and the first infected wild animal, an elk from Rocky Mountain National Park, was documented in 1981.

Applying Science and Expertise to Wildlife Challenges

Interactions of Wild and Farmed Cervids Through Game-Farm Fences—NWRC biologists are using track plots and motion-activated video to determine how farmed and wild cervids (mule deer, white-tailed deer, and Rocky Mountain elk) interact through game-farm fences. The primary objective of the study is to determine if disease transmission risk exists along game-farm fences. Nine fences around elk farms in Colorado and five fences around white-tailed deer farms in Michigan are being evaluated.

Observations have found considerable variation in the species, sex, age class, and number of wild cervids that frequent game-farm fencelines. Preliminary information indicates that direct interactions between farmed and wild white-tailed deer appear less common than between farmed and wild elk. Game-farm management practices such as stocking rates, proximity of males to females, feeding procedures and fence construction all appear to contribute to the potential for interaction. Based on these results, recommendations for methods of reducing interactions will be developed and made available to ranchers.

Transmission and Spread of CWD—CWD is believed to be spread from animal to animal by direct contact (i.e., nose-to-nose) or by contamination of feed or environment in saliva, urine, and/or feces. New evidence suggests that CWD can be transmitted through the environment in soil contaminated by decomposing carcasses. The spread of CWD likely occurs by two main conduits: 1) through the natural dispersal and migration of wild cervids, and 2) by the inter- and intra-state transport of captive farmed cervids.

In western Nebraska, where CWD occurs, NWRC is using telemetry to learn about the ranges and movements of mule and white-tailed deer. At the same time, surveillance is being conducted at the county level to locate infected deer, particularly along the North Platte River. The potential exists for CWD to move east along the river rather quickly if management actions are not taken. NWRC researchers are also continuing a long-term study of the ecology of deer along the Missouri River. Data from these studies will be used in the development of movement models and formation of management decisions.

Sanitation and Decontamination CWD-infected Surfaces and Sites—Meat processors, hunters, farmers, and other constituents need effective methods and techniques for eliminating the spread of CWD and other transmissible spongiform encephalopathies (i.e., Bovine Spongiform Encephalopathy, scrapie, Crutzfeldt-Jacob Disease). NWRC scientists are working to develop an enzymatic product that breaks down prion proteins, rendering them harmless. This product could potentially be used to sanitize and decontaminate tools, surfaces, and facilities infected with transmissible spongiform encephalopathies.

Groups Affected by This Problem:

- Wildlife and natural resource managers
- U.S. citizens
- Livestock producers and farmers
- Sporting organizations
- Consumers
- Meat processors
- Rural communities

Major Cooperators:

- USDA/APHIS/Wildlife Services
- USDA/APHIS/Veterinary Services
- University of Nebraska
- Colorado State University
- State Departments of Public Health
- Wisconsin Department of Natural Resources
- Michigan Department of Natural Resources
- University of Wisconsin
- Cervid Research and Recovery Institute
- Private elk farmers

Cervid Population Estimation and Removal Techniques—

Methods are needed to accurately estimate deer and elk populations and to remove potentially diseased animals from infected areas. For example, when CWD was found in Wisconsin, the State's Department of Natural Resources decided to eliminate deer from four counties to prevent the spread and establishment of the disease. NWRC researchers are investigating the use of infrared and computer-based image recognition systems to aid in locating and removing diseased animals.

Development of Efficient Means to Detect CWD in Cervids—

NWRC scientists and collaborators are developing more efficient methods for detecting CWD in both dead and live cervids. Current tests on dead animals are expensive and time-consuming, which limit the number of animals tested. Current tests on live animals are quite invasive, requiring anesthesia and are only effective for deer. A new method developed at NWRC involves taking a small sample from the parotid lymph node (at base of ear, just under the skin) of a live or dead cervid. The biopsy takes less than 2 minutes to perform and is more efficient and less invasive than current tests.

Vaccine Development—NWRC scientists have developed several experimental CWD vaccines that create an immune response to the prion protein. By creating an immune response, antibodies block the contact points between abnormal and normal prions, thereby preventing replication of the disease. Initial tests using rabbits produced antibodies to three of the seven vaccines. The next phase of research will test the efficacy and safety of the vaccines.

NWRC scientists are highly qualified to research CWD transmission between wild and domestic cervids because of their expertise in cervid and disease ecology, biology, and management. Additionally, disease specialists and field personnel are available throughout the country for ongoing, long-term surveillance and research studies which will enable them to address and answer questions related to CWD spread through populations and across landscapes. Once more is learned about the ecology of the disease; the cervids and other species it affects; and the transmission, prevalence and persistence of CWD in wild and captive cervids, the knowledge can be used not only to manage the disease but also to educate the public about CWD disease and any associated risks. Insights gained through these studies will also aid in the understanding of other wildlife diseases, such as bovine spongiform encephalopathy.

Selected Presentations:

- McLean, R. G., Clark L., Dunbar M. R., VerCauteren, K. C. 2004. Wildlife disease research at the APHIS National Wildlife Research Center. United States Animal Health Association 108th Annual Meeting. Greensboro, NC.
- VerCauteren, K. C. 2004. Decision model for selecting fences to reduce deer damage. Nebraska Wildlife Services State Conference. Nebraska City, NE.
- VerCauteren, K. C. 2004. Evaluation of a fence for selectively excluding elk. 2004 Colorado Chapter of The Wildlife Society Summer Meeting. Estes Park, CO.
- VerCauteren, K. C. 2004. Fencing and frightening devices. Wildlife Damage Management for Natural Resource Managers. Olympia, WA.
- VerCauteren, K. C. 2004. Cervid disease research at the National Wildlife Research Center. Vertebrate Pest Conference. Visalia, CA.